



## BMP Objectives

- Soil Stabilization
- Sediment Control
- Tracking Control
- Wind Erosion Control
- Non-Storm Water

**Definition and Purpose** Mulching is the process of applying loose bulk materials to the soil surface as a permanent or temporary cover. Common types of mulch are: straw, wood/bark chips, and green material.

The primary function of mulching is to reduce erosion by protecting bare soil from rainfall impact, increasing infiltration, and reducing runoff. Mulches are also generally used to compliment seeding and vegetation establishment techniques, by serving as protection for the soil before the seeds and vegetation have had a chance to grow and establish, although some mulches like aggregates and wood/bark chips have been used in lieu of long-term established vegetation.

**Appropriate Applications** Mulching is considered an erosion control (soil stabilization) alternative in the following situations:

- As a stand-alone temporary surface cover on disturbed areas until soils can be prepared for revegetation and permanent vegetative cover can be established.
- As short term, non-vegetative ground cover on slopes to reduce rainfall impact, decrease the velocity of sheet flow, settle out sediment and reduce wind erosion.
- As long term, non-vegetative ground cover around established plants, such as trees or shrubs, and on flat to minor slopes not otherwise protected from erosion due to wind and rain.

## Limitations **Straw**

There is a potential for introduction of weed-seed and unwanted plant material in sensitive areas, however rice straw can be used in sensitive areas. Most critical limitation is that where straw blowers are used to apply mulch, areas for treatment must be within 45 m (150 ft) of a road or surface capable of supporting vehicular traffic.

## **Wood/Bark Chips**

Primarily used in areas as a temporary ground cover around trees, shrubs and landscape plantings. Erosion control effectiveness is unknown, but is considered poor. Chips are difficult if not impossible to anchor on steepened slopes and may be blown by high winds. Shredded products tend to hold together better than chips, and stay on slopes better and are less subject to wind erosion. However, shredded bark has been known to catch fire from cigarettes discarded from vehicle windows. In addition, they do not withstand concentrated flows and are prone to sheet erosion. Note: Caltrans has used shredded wood/bark materials on slopes up to 1:2 (V:H) with reported success. However, until material properties can be standardized and formal field trials completed, use of wood/bark chips and shredded materials on steep slopes should be limited to non-critical applications and where backup measures can be readily deployed.

## **Green Material**

Green material is not always commercially available and quality is variable. There is a potential for the presence of unwanted weeds and other plant materials. Delivery system is primarily by manual labor, although pneumatic application equipment is available. Erosion control effectiveness is generally unpredictable and should be considered poor unless oversprayed with a tackifying agent. Depending on the material, it might require additional fertilizer inputs, thus increasing costs. Note: Caltrans has used green material on slopes up to 1:2 (V:H) with reported success. However, until material properties can be standardized, use of green material on steep slopes should be limited to non-critical application and where backup measures can be readily deployed.

## Design Guidance **Mulch Selection**

There are many types of mulches, and selection of the appropriate type should be based on the type of application and site conditions. The following criteria should be considered in selection of the appropriate mulch:

- Cost
  - Material cost
  - Preparation cost
  - Installation cost
  - Add-ons

- Effectiveness
  - Reduction of erosion
  - Reduction of flow velocity
  - Reduction of runoff
- Acceptability
  - Environmental compatibility
  - Institutional/regulatory acceptability
  - Visual impact
- Vegetation Enhancement
  - Native plant compatibility
  - Germination rate
  - Growth rate
  - Moisture retention
  - Temperature modification
  - Open space/coverage
  - Nutrient uptake
- Installation
  - Durability
  - Longevity
  - Ease of installation
  - Safety
- Operation and Maintenance
  - Maintenance frequency
  - Need for fertilization
  - Need for temporary irrigation

## ***Application Procedures***

Prior to application, after existing vegetation has been removed, roughen embankment and fill areas by rolling with a crimping or punching type roller or by track walking. Track walking should only be used where rolling is impractical.

The construction-application procedures for mulches vary significantly depending upon the type of mulching method specified. Three (3) methods are highlighted here:

- Straw: Loose straw is the most common mulch material used in conjunction with direct seeding of soil. Mulching is the generally the second part of a

multi-step process which should be implemented as follows:

- Apply seed and fertilizer to the bare soil.
- Apply loose straw over the top of the seed/fertilizer at a rate of 1,500 – 2,000 lb./acre (681 - 908 kg/acre), either by machine or by hand distribution.
- The straw must be evenly distributed on the soil surface.
- Anchor the straw in place by using a tackifier, netting, or "punch" it into the soil mechanically.

Methods for holding the mulch in place depend upon the slope steepness, accessibility, soil conditions and longevity. "Punching" straw into the soil is the best way to anchor it in place:

- On small areas, a spade or shovel can be used.
  - On slopes with soils which are stable enough and of sufficient gradient to safely support construction equipment without contributing to compaction and instability problems, straw can be "punched" into the ground using a knife-blade roller or a straight bladed coulter, known commercially as a "crimper" or "sheepsfoot".
  - On small areas and/or steepened slopes, straw can also be held in place using plastic netting. The netting should be held in place using 11 gauge wire staples, geotextile pins or wooden stakes (as described in the "Geotextiles, Mats/Plastic Covers and Erosion Control Blankets" BMP shown in the *Storm Water Quality Handbooks - Construction Site Best Management Practices Guide*.)
  - Where slopes are too steep to support construction equipment or areas of application too large to allow cost-effective use of nettings, straw should be held in place using any number of tackifiers which act to glue the straw together and to the soil surface. The tackifiers should be selected on the basis of their longevity and ability to hold the fibers in place until vegetation is established through the mulch.
- **Green Material:** This type of mulch is produced by recycling of vegetation, such as grass, shredded shrubs and trees. Green material can be spread by hand, however pneumatic methods are available. Mulch should be composted to kill weed seeds.
- It can be used as a temporary ground cover.
  - The green material should be evenly distributed on site to a depth of not more than 100 mm (4 in).

- Anchoring green material in place with a tackifier is necessary on steep slopes.
- Wood/Bark Chips: Suitable for ground cover in ornamental or revegetated plantings.
  - Wood/bark chips are not suitable for steep slopes. Shredded wood/bark is conditionally suitable; see note under limitations.
  - Can be spread by hand (however pneumatic methods are available).
  - The mulch should be evenly distributed across the soil surface to a depth of 50 mm (2 in) to 75 mm (3 in).

Note: Avoid mulch over-spray onto the traveled way, sidewalks, lined drainage channels, and existing vegetation.

## Maintenance and Inspection

Regardless of the mulching technique selected, the key consideration in maintenance and inspection is that the mulch needs to last long enough to achieve erosion-control objectives. Mulches applied to temporarily stabilized seeded areas must last as long as it takes for vegetation to develop and provide permanent, erosion-resistant cover. If the mulch is applied as a stand-alone erosion control method over disturbed areas (without seed), it should last the length of time the site will remain barren or until final re-grading and revegetation. Conversely, if the mulch is utilized as part of a revegetation strategy, then a balance should be struck between the degradation of the mulch and the emergence of vegetation over time.

Where vegetation is the ultimate cover, maintenance and inspection should focus on the quality and diversity of vegetation establishment through the mulch. Where vegetation is not the ultimate cover, such as ornamental and landscape applications of bark or wood chips, inspection and maintenance should focus on longevity and integrity of the mulch.